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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

Appl. No.	:	10/677,545
Applicant	:	Eric Chao XU
Filed	:	October 2, 2003
Title	:	MULTI-STAGE AP MECHANICAL PULPING WITH REFINER BLOW LINE TREATMENT
TC/A.U.	:	1791
Examiner	:	Dennis R. Cordray
Docket No.	:	ANDRPR/385/US
Customer No.		002543

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Honorable Sir:

REPLY BRIEF
UNDER 37 C.F.R. §41.47

This Reply Brief is responsive to the Examiner's Answer mailed February 2, 2009.

CERTIFICATE OF MAILING

I hereby certify that this correspondence is being deposited on the date below with the United States Postal Service as first class mail in an envelope addressed to "Mail Stop Appeal Brief-Patents, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450."

Signature: L. James Ristas   Reg. No. 28,663   Date: March 31, 2009

TABLE OF CONTENTS

ITEM		PAGE(S)
I.	TABLE OF AUTHORITIES	3
II.	STATEMENT OF ADDITIONAL FACTS	3
III.	ARGUMENT	4
	The Technical Problem and The Inventive Solution	4
	The Haynes Reference Addresses The Problem Differently	5
	The Cannell And Prusas References Are Not Compatible With Haynes	7
	The Examiner Does Not Account For The Differences Between BCTMP And APP As Taught By Cannell	8
	The Claimed Invention Is Not A Mere Routine Optimization Of Known Result-Effective Variables	10
	Applicant Should Not Be Required To Show Critical Results From A Novel Combination Of NaOH Impregnation Pretreatment And NaOH AP Blow Line Injection	12
	The Analysis Under 35 U.S.C. §103 Must Not Merely Piece Together Elements Taken Arbitrarily From Different References	13
	The Remaining Claims Are Likewise Patentable	14
	Conclusion	15

I. TABLE OF AUTHORITIES

35 U.S.C. §103 . . . . pp. 13, 14, 15

II. STATEMENT OF ADDITIONAL FACTS

The examiner asserts in the second sentence on page 5 of the Answer, that "feed material in the form of wood chips has been previously refined". Although wood chips are a product of size reduction (comminution) of logs, this comminution is not considered "refining" in the relevant field. "Refining" is defined as the "mechanical treatment of fibers to enhance bonding" and "fiber" is defined as "the slender, thread like cellular structure that forms the main part of a tree trunk and from separated and suitably treated, cohere to form a sheet of paper." (http://www.paperonweb.com/dict11.htm). Chopping logs into wood chips does not mechanically treat the <u>fibers</u>, and is therefore not refining.

III. ARGUMENT

The Technical Problem And The Inventive Solution

Significant difficulties are presented for achieving cost-effective production of chemi-mechanical pulp with commercially acceptable brightness, in pressurized disc refiner systems. High pressure, high consistency refining has many advantages over atmospheric/low pressure refining, but a major disadvantage is the darkening of the chips due to the high temperature.

Bleaching is necessary to achieve acceptable brightness, and hydrogen peroxide is the most commonly used bleaching agent. It is known to use an alkaline solution, most commonly sodium hydroxide solution, as a pretreatment to swell the chips as an aide to the comminution of the chips and fibers in the refiner, and is thus typically introduced before or into the refiner, whereas the hydrogen peroxide is typically introduced after the refiner, in a pulp retention vessel or tower. Sodium hydroxide can also contribute to the effectiveness of the hydrogen peroxide bleaching however, in pressurized refiners, this poses one particular problem. At the higher temperatures of pressurized refiners, the hydrogen peroxide breaks down more quickly and the presence of the alkali darkens the fibers, both

of which undermine the desired brightening.

Applicant's invention as defined in all independent claims includes introduction of sodium hydroxide alkali <u>and</u> hydrogen peroxide (NaOH AP) <u>after</u> a pressurized refiner, in combination with applying NaOH AP impregnation pre-treatment to lignocellulosic material <u>before</u> refining. Example Set C shows the surprising results that even in a highly pressurized system, bleaching efficiency similar to that obtained with atmospheric refiner inlet pressure, can be achieved by shifting NaOH AP injection from the refiner eye to the refiner blow line. This concept as defined in the claims is not readily derivable from the cited references. (See Brief p. 3, line 7 – p. 4, line 8)

This Reply Brief is focused on claim 1 and claims 50-52, but the arguments made with respect to claim 1 are also applicable to the other claims.

<u>The Haynes Reference Addresses The Problem Differently</u>

The Haynes reference is relied on by the examiner as solving the same problem in substantially the same way, i.e., producing chemi-mechancial pulp in a pressurized disc refiner without excessive darkening of the pulp, by introducing an alkaline peroxide (AP) solution both before

the refiner and in the blowline after the refiner. Applicant disagrees that Haynes teaches the significance of AP pretreatment before the refiner in combination with introducing AP in the blowline, and applicant further disagrees with the examiner that use of NaOH AP as the AP solution is compatible with Haynes. (See Answer p. 5, second par.)

One of ordinary skill in the art would recognize that Haynes in essence (1) "gave up" on using NaOH AP before and after the refiner and (2) in so "giving up" was not motivated to consider and did not consider using NaOH AP in upstream impregnation along with NaOH AP in the blowline. (See Brief p. 11, line 21 – p. 12, line 20)

Haynes addresses this darkening problem by substituting an alkali buffer for all or most of the sodium hydroxide, at every point where AP might be introduced. Haynes does not disclose, teach, or suggest that any synergy with post-refiner AP can arise if the chip processing with AP upstream of the refiner is performed with pressing impregnation. There is no basis in any reference that would motivate one of ordinary skill to add expensive equipment for pre-refiner pressing and AP impregnation to the Haynes process; Haynes teaches that satisfactory results in a system of high pressure primary refiner followed by a secondary refiners can be achieved by reducing the detrimental temperature effects on the bleaching,

solely via a change in the composition of the alkaline to avoid the NaOH that is central to applicant's NaOH AP.

The Cannell And Prusas References Are Not Compatible With Haynes

Applicant disagrees with the examiner's further assertion that since it was allegedly known (Cannell as modified by Prusas) to pretreat wood chips with AP impregnation upstream of a pressurized refiner it would have been obvious to modify the mere introduction of upstream AP in Haynes, by the more intense action of impregnating the chips with AP solution. (See Answer p. 7, lines 4-13) The Haynes, Cannell, and Prusas references take very different approaches to chemimechanical pulping and should not be presumed to have compatible process steps. There must be some reasonable basis for an expectation of success in this crowded field. There is nothing in Haynes, Cannell, and Prusas to suggest that interchanging any process steps would improve the results of the Haynes process, given that Haynes solved the problem in a different way. Why would one of ordinary skill start with Haynes and revert to the use of NaOH AP when Haynes teaches away from such use? (See Brief p. 12, line 1 – p. 13, line 14)

The examiner asserts that because Haynes does not explicitly denigrate NaOH AP and even permits the bleaching liquor to have some NaOH, one of ordinary skill in the art would not be discouraged or "taught away" from using NaOH AP both before and after the refiner. (See Answer p. 12, line 13 – p. 13, line 18) The motivation of one of ordinary skill is to be determined by what such person would derive from reading the reference as a whole, i.e., what it teaches to such person who employs professional common sense. Since the whole point of Haynes is to substitute the buffered alkaline for NaOH to the extent possible, and no examples show NaOH as the component of the AP, common sense would tell such practitioner that the method of Haynes would be degraded to the extent the AP contained NaOH.

The Examiner Does Not Account For The Differences Between BCTMP And APP As Taught By Cannell

In the Answer (p. 6, lines 9-15 and p. 14, lines 16-22) the examiner relies on the teaching of Cannell with respect to BCTMP (bleached chemical thermomechanical pulp) as modifying Haynes, but Cannell distinguishes BCTMP from the APP (alkaline peroxide pulp) process such as Haynes. BCTMP impregnates the chips with sodium sulfite and refining is at pressure, followed by bleaching. In APP alkaline peroxide is used to

impregnate the chips and refining is atmospheric, followed by bleaching. Cannell does not disclose or suggest AP in pressurized refiner systems. To the extent that Cannel can be construed as implying that that APP can include varying the alkali/peroxide split between impregnation and the post-bleach, it should be presumed that the post-bleach refers to a bleaching <u>tower</u> after the atmospheric refiner. Such non-pressurized systems do not have a blow valve or intermediate line between a pressurized refiner and next processing component. (See Brief p. 16, line 28 – p. 17, line 8)

To the extent the examiner recognizes this deficiency in Cannel, where there is no disclosure of AP impregnation upstream of high pressure refining, the examiner relies on Prusas as disclosing AP impregnation upstream of high pressure refining. (See Answer p. 6, line 16 – p. 7, line 13) Prusas does disclose AP impregnation upstream of a pressurized refiner, but he clearly teaches the removal of the AP and further pretreatment by sodium sulfite cooking before refining. (See Brief p. 17, lines 9-11) Thus Prusas reverts to the principal aspect of BCTMP immediately upstream of the refiner. The possibility that some AP might not be drained fully and would be carried over into the sulfite cooking step of Prusas, does not teach an ordinary practitioner that it would be desirable to substitute an AP impregnation step into the high pressure refining

BCTMP process of Cannel, or to convert the APP low pressure process of Cannell into a high pressure refining process.

Although not argued in the main Brief, applicant notes that when Cannel and Prusas refer to post-refiner bleaching, one of ordinary skill would understand that as conventional bleaching with hydrogen peroxide (P) in a tower, not bleaching with either P or AP in the intermediate line between the refiner and a downstream component.

The rejections are not based on any nexus of teachings, suggestions or motivations among the references for combining the NaOH AP pretreatment and the NaOH AP blowline introduction claimed by Applicant.

<u>The Claimed Invention Is Not A Mere Routine Optimization Of Known Result-Effective Variables</u>

The examiner notes that applicant is merely optimizing "result effective variables". (See Answer p. 15, lines 1-11)

As applicant previously argued, when a substantial fraction of the overall NaOH AP is applied at or near the blow valve in the post refiner intermediate line, in combination with the NaOH AP pressing/impregnation of the chips upstream of the refiner, better energy efficiency and more efficient bleaching are achieved. (See Brief p. 15, lines 1-12) By moving a greater number of chemical reactions downstream relative to conventional

techniques, with the improved mixing at the blow valve or at least the blow line, the AP can perform its chemical bleaching with far less a degradation which would otherwise occur with AP introduction at or upstream of the refiner in a high pressure refining system. Although not previously argued explicitly, it is evident that by adding two chemicals (NaOH and H_2O_2) in two treatment locations, better control of the chemicals is achieved in that each location receives what is needed at that location, without excess chemicals present to adversely impact the treatment and the further processing.

The examiner asserts that the relative chemistry before and after the refiner is not shown to be critical and in any event merely applies known result-effective variables. This is not the case. The well-known darkening problem in trying to bleach the chips and pulp upstream of a bleaching tower in pressurized refiner systems is not solvable by simply adjusting "result effective variables", or else this problem would have been solved long ago. The advantage obtained by applicant is due to the combination of NaOH AP pretreatment impregnation, and NaOH AP blow line injection, whereby the material exits the refiner in a different condition than in the prior art, and is thereby more amenable to controlled injection of NaOH AP at the blowline.

Applicant Should Not Be Required To Show Critical Results From A Novel Combination Of NaOH Impregnation Pretreatment And NaOH AP Blow Line Injection

In the Answer (p.13, lines 17-22), the examiner notes an alleged absence in Applicant's specification of examples showing unobvious results. The effectiveness of the NaOH AP introduction at the blow line is very much dependent on the pretreatment NaOH AP impregnation step recited in Applicant's claims. None of the references recognizes this.

There is no basis among the references for one of ordinary skill to appreciate the particularly efficacious results arising from the specific combination of such pretreatment with such blow line addition, i.e., specific NaOH AP impregnation pretreatment and blowline injection. Haynes takes two scattershot approaches: (1) one should substitute the bleaching liquor of Haynes for NaOH wherever one might chose to introduce bleaching liquor, and (2) there is no special interest or optimization on whether or how bleaching liquor should be introduced before or after the refiner. Haynes believes he avoids the problem of darkening so he does not provide any guidance on process optimization.

Especially with respect to applicant's claims 50-52, important preferences are specified. These claims all flow from claims 1 and, 5, the latter of which recites that mixing is immediately followed by introducing the

mixture into a separator and the separated pulp is then discharged into the retention vessel. Claims 50 and 51 specify the temperature and consistency of the pulp in the blowline and as discharged and retained in the retention vessel, and that more than one third of the total NaOH AP solution is added at the blow line.

As noted previously (See Brief p. 15, lines 1-12), the ability to introduce this much NaOH AP in the blowline after the pressurized primary refiner before the retention vessel, with the pulp at the specified temperatures and consistency, without excessive high temperature darkening and while getting a "head start' on bleaching upstream of the retention vessel, is strongly dependent on the chips having been pressed and NaOH AP impregnated in the pretreatment upstream of the refiner. Claim 52 emphasizes this by reciting that the chips are twice subjected to such pretreatment.

<u>The Analysis Under 35 U.S.C. §103 Must Not Merely Piece Together Elements Taken Arbitrarily From Different References</u>

Applicant asserts that the foregoing summary of the Haynes reference, points to three teachings: (1) In alkaline peroxide type chemi-mechanical pulping, a different type of (buffering) alkali should be substituted for sodium hydroxide, (2) the substituted alkali (A) should be

introduced before or in the primary refiner, and (3) the substituted alkaline and peroxide combination (AP) should be introduced after the primary refiner. Without impermissible use of applicant's claims as a blue print for analyzing the Haynes reference, one of ordinary skill (and thus the examiner) should view the Haynes examples as teaching introduction of an A refiner solution and an AP blowline solution.

Thus, although Haynes describes a pressurized primary refiner, he teaches away from using sodium hydroxide as the alkali component in a pressurized AP refiner pulping system. Cannell and Prusas similarly teach away from using any AP impregnation in a pressurized system (at least without removing the AP before refining per Prusas).

For these reasons, the combination of pressing and NaOH AP impregnation pretreatment in a pressurized primary refiner followed by NaOH AP injection in the blow line, defines patentable subject matter relative to Haynes, Cannell and Prusas under 35 U.S.C. §103.

The Remaining Claims Are Likewise Patentable

Applicant has herein focused on claims 1 and 50-52, but believes the patentability of the other claims has been adequately addressed in the main Appeal Brief.

Conclusion

For the foregoing reasons, applicant contends that (1) one of ordinary skill in the relevant field would not attempt to combine the disclosures or teachings of Haynes, Cannell, and Prusas under the legal standards applicable to 35 U.S.C. §103, (2) the examiner has relied on impermissible hindsight reconstruction based on applicant's specification to make this combination as the foundation for all rejections, and (3) the claims recite a unique and non-obvious series of steps by which NaOH AP is used in a pressurized disc refiner system to produce pulp having satisfactory brightness.

Applicant requests that the Board reverse the examiner on all grounds.

Respectfully submitted,
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